707 4th Street, Suite 200
Davis, CA 95616
530.753.6400
530.753.7030 fax
www.lwa.com

LARRY WALKER ASSOCIATES

October 23, 2008

Mr. Ken Landau
Assistant Executive Officer
California Regional Water Quality Control Board
Central Valley Region
11020 Sun Center Drive #200
Rancho Cordova, CA 95670-6114

Subject: Response to Review of the City of Grass Valley Copper and Zinc WER Study

Dear Mr. Landau,

Thank you for forwarding Tetra Tech's comments on the City of Grass Valley Copper and Zinc WER Study ("WER Study") dated June 27, 2008. Clarifications and responses to those comments are detailed below.

COMMENT 1

It is known that Wolf Creek serves as a conveyance for irrigation water during the naturally dry season. No samples for use in WER testing were collected between early March and late September, indicating that potential differences in water quality due to the presence of irrigation water were not evaluated through toxicity testing. Because this water may have different concentrations of various complexing agents (e.g. organic carbon), the toxicity of copper and zinc might be different than what was observed during the periods sampled for this study. It is unclear whether the presence of such irrigation water would be expected to substantially alter the results of WER tests presented here. Further discussion, if not additional testing, may be necessary to ensure the final WER values are adequately protective.

RESPONSE 1

Concerns were raised that sampling events did not include the summer period. However, this was an intentional decision, since the low flow period in Wolf Creek occurs in the October through December time frame. Summer flows in the Creek are typically elevated due to the presence of flows released from NID reservoirs to serve downstream water users.

It should also be noted that any differences in the quality of Wolf Creek between summer and the low flow period actually sampled is not of great importance since the WER values ultimately selected were those based on the City's effluent. This decision was made because the City's NPDES permit does not consider dilution in the establishment of effluent limits protective of aquatic uses, such as dissolved copper and dissolved zinc.

Conditions observed in WER sampling are representative of flow and quality conditions that may occasionally occur in the summer when NID releases are low. Data collected during both seasons shows similar total and dissolved copper and zinc concentrations, as well as similar total suspended solids concentrations, as shown below for Station R-1 data:

Comparison of High and Low Flow Conditions in Wolf Creek at Station R-1

Average Concentrations over Flow period	High Flow April 15 – October 15	Low Flow October 16 – April 14
TSS (mg/L)	19	12
Dissolved Copper (ug/L)	1.0	0.8
Dissolved Zinc (ug/L)	4.0	4.0
Dissolved Organic Carbon (mg/L)	2.3	3.4
Dissolved Oxygen (mg/L)	8.7	9.7
pH (S.U)	7.1	7.5
Turbidity (NTU)	8.0	7.6
Temperature (deg F)	59.4	53.3

COMMENT 2

The use of Ceriodaphnia dubia *as the primary test species for both copper and zinc appears appropriate. However, the study states that test volumes of 120 ml were used for each of four test replicates. This is an unusually large volume for use in testing with this species. Appendix 4, however, states that a test volume of 15 ml was used. This is likely a simple editorial error, but should be corrected to avoid confusion.*

RESPONSE 2

Appendix 4 provides the minimum recommended test volume (15 mL) as specified by the toxicity method [*Ceriodaphnia dubia*, Acute Toxicity tests with Effluents and Receiving Waters (EPA-821-R-02-012 and EPA/600/4-90/027F)]. However, for this Study, larger volumes (120 mL) were used to ensure adequate volume for analytical testing of copper and zinc.

COMMENT 3

The study reports that "...a secondary freshwater aquatic tests species (fathead minnow) was used to verify zinc toxicity test results obtained from Ceriodaphnia dubia, *per the 1994 Interim Guidance. Results of these tests confirmed that* Ceriodaphnia dubia *was appropriately conservative for the development of zinc WERs." Use of such confirmatory tests is in agreement with the methods outlined in the guidance (EPA 1994), however no further detail is provided to allow this statement to be verified. The actual test results and raw test data should be provided to support this assertion.*

RESPONSE 3

According to the 1994 WER Guidance, "a WER obtained with a primary test species is considered confirmed if either or both of the following are true:

1) the WERs obtained with the primary & secondary species are within a factor of 3, or
2) the test, regardless of whether it is the primary or secondary test, that gives the higher endpoint in the laboratory dilution water also gives the larger WER."

As presented in the table below, the WERs obtained from the fathead minnow and *Ceriodaphnia dubia* tests were within a factor of 3.

	Dissolved Zinc Toxicity Testing			
	F. Minnow EC50 (ug/L)	**WER**	***C. dubia* EC50 (ug/L)**	**WER**
Effluent	1100	1.49	488	1.74
Lab Water	739		280.5	
SDW	1002	1.13	270	0.77
Lab Water	884		351	

Fathead minnow toxicity test results and raw test data are attached to this response letter.

COMMENT 4

It does not appear that methods for calculating a final WER value listed in Section 1.A.5. of the 1994 WER guidance were followed for calculation of the zinc WER. Use of this approach would take into account any effects from the various flow regimes at the time of sample collection (both effluent discharge and stream flow) on the final WER value. Use of this approach to calculate the zinc WER is recommended.

RESPONSE 4

As discussed in RESPONSE 6, below, the City's discharge receives no credit for receiving water dilution. Therefore, the recommended WERs were calculated using 100% effluent (not simulated downstream water). In this scenario, stream flow variability is not a factor, so the 1994 Guidance flow-based methodology is not applicable. The 2001 Streamlined Guidance, as well as several other WER studies in California (such as the San Francisco Bay and Calleguas Creek Watershed Copper WER studies) used the geometric mean as the methodology for calculating final WERs. The calculation approach was developed for the above studies in conjunction with Technical Advisory Committee members and Regional Water Board staff participating in each study. The geometric mean is a measure of the central tendency of a data set that minimizes the effects of extreme values.

COMMENT 5

The 2001 guidance requires that the final acute copper value generated in laboratory water for each WER be compared to the species mean acute value (SMAV) for the corresponding species (in this case, C. dubia) to ensure that the laboratory value is appropriate. Further, the WER for each test event should be calculated using the higher *of the two (laboratory water or SMAV) values. This report does not indicate whether such a comparison was made.*

RESPONSE 5

The SMAV for copper for Ceriodaphnia dubia, as referenced in the U.S. EPA's *2007 Aquatic Life Ambient Freshwater Quality Criteria – Copper* document, is 5.93 ug/L (dissolved copper at hardness of 100 mg/L). Using the conversions from the 2001 Streamlined Guidance to translate this SMAV to the appropriate site-water hardness, the labwater EC50s for dissolved and total copper, the SMAVs and the lab water hardness for this Study were:

Lab Water EC50 (Dissolved Copper, ug/L)	Lab Water EC50 (Total Copper, ug/L)	SMAV (ug/L)	Hardness (mg/L)
13.1	15.2	8.8	152
4.7	5.8	4.9	82
9.7	12.2	8.4	145
6.4	7.4	5.6	95
14	16.0	8.0	137
5.8	7.2	5.4	90

This comparison (lab water EC50 greater than SMAV) indicates that using the lab water EC50 results from this study in the calculation of WERs is the appropriate methodology. In one instance, the lab water EC50 is slightly lower than the adjusted SMAV. Because these values are so similar, and for consistency in calculation methodology, the lab water EC50 value was used to calculate the site-specific WER.

COMMENT 6

The report recommends that the WERs calculated using effluent (not simulated downstream water) and laboratory water should be used in setting future effluent limitations. This approach is not supported by either the 1994 or 2001 WER guidance documents. WERs calculated based on simulated downstream water should be used, not those based solely on effluent.

RESPONSE 6

The City's discharge to Wolf Creek receives no credit for receiving water dilution. Therefore, it is recommended that the effluent-derived WERs be used for future effluent limit calculations, as the use of simulated downstream water would require the allowance of a dilution factor for combining the effluent and R-1 waters.

COMMENT 7

No raw toxicity test data (e.g., bench sheets or test summary data) were presented in this report. Without such data it is impossible to fully evaluate the quality of the toxicity tests used to generate the reported WERs. It is necessary to evaluate the raw toxicity test data to ensure that method-mandated test acceptability criteria (e.g., control performance) and other methodological requirements were satisfied. It is recommended that the *submission and review of such information be required by the Regional Board prior to approval of the submitted WER study.*

RESPONSE 7
Toxicity test results and raw test data for all events are attached to this response letter.

SUMMARY

We believe that the above responses completely address the concerns raised in the Tetra Tech memorandum dated June 27, 2008. As such, it is requested that the effluent-based WER values for copper and zinc be used in the development of the NPDES permit for the City of Grass Valley.

Please contact me if you have any questions.

Sincerely,

Kristine Corneillie

Kristine Corneillie
Senior Engineer